Efficiency and Fidelity in Dendrimer Synthesis

Craig J. Hawker, IBM Almaden, DMR-0210247 and INT-0129303

A highly efficient route to triazole linked dendrimers is now available thanks to the unprecedented reliability of the Cu(I)-catalyzed ligation of terminal acetylenes and azides. This *"Click Chemistry"* is highly regioselective, resulting in 1,4-disubstituted triazoles. A wide variety of functional groups are compatible with the process and the only major byproduct formed in the reaction is NaCl. This greatly facilitates purification and all second generation and some third generation dendrons were directly isolated as pure solids (*i.e.* no chromatographic separations), meeting the requirements for large scale applications.

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Journal cover showing structural diversity possible in dendrimer syntheses based on the highly efficient construction of triazoles from functionalized azides and alkynes

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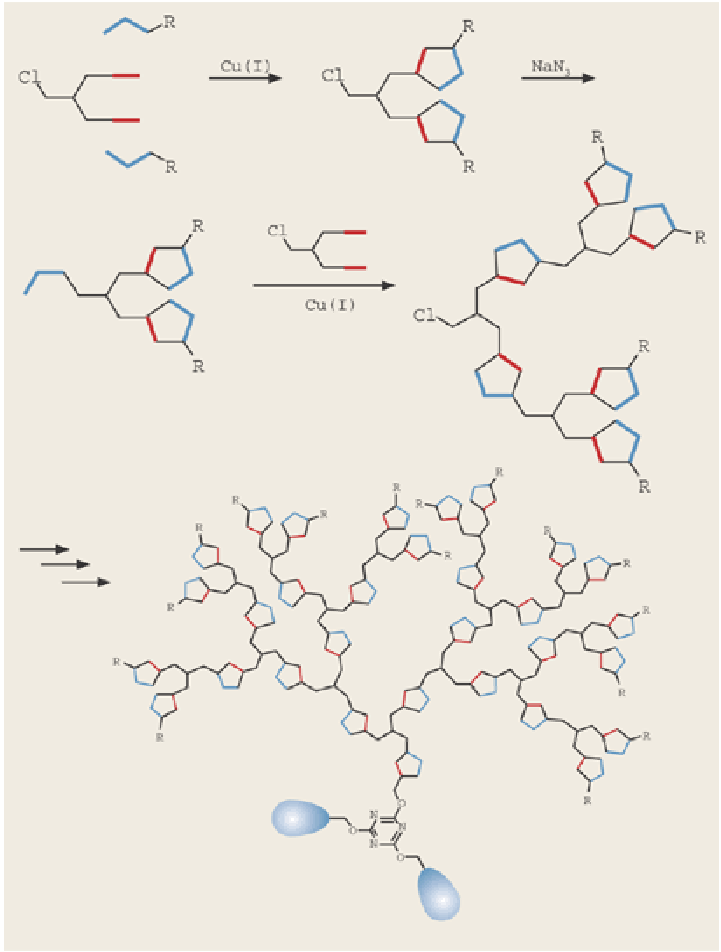

General synthetic strategy for the construction of dendrimers using *Click Chemistry* showing the versatility in repeat unit and chain end selection

Education and Outreach:

Under these grants, a very diverse and highly interactive group of international researchers have come together to collaborate and tackle a major challenge – a viable and economical method for the construction of dendrimers. Students from a classical organic synthesis group (Sharpless) and polymeric materials groups (Hawker, Fréchet and Voit) have worked together and benefited from the cross-disciplinary training and exposure to new areas. Arnulf Scheel, a Ph.D. student from Brigitte Voit's group in Dresden performed many of the initial studies and spent 3 months at IBM. An undergraduate student, Anne Nugent from Washington University, performed a 3 months summer internship at IBM and Berkeley working on the program before returning to Karen Wooley's group at WU, where the work continues. Dr. Jeffrey Pyun was a post-doctoral worker from Jean Fréchet's group at UC Berkeley who spent 6 months at IBM conducting research into *Click Chemistry* and its application to dendrimers and other polymers. Jeff has recently left to become as Assistant Professor at the University of Arizona